



Agents for diffusion of agricultural innovations for environmental outcomes



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ABSTRACT

In New Zealand, local governments are tasked with both sustainably managing natural resources and supporting adoption of practices and technologies for environmental outcomes. Unfortunately, farmers in New Zealand lack trust in advice on environmental performance provided by local governments. Hence, local governments may seek to partner with others to disseminate information about environmentally friendly practices and technologies to farmers. Empirical evidence indicates that New Zealand farmers are more likely to adopt new practices after seeing them successfully demonstrated; therefore, local government would do well to partner with those who have tried the practices themselves and those with large farmer networks. In this paper, we use unique survey data to identify the characteristics of such “innovators” and “connectors”. We also identify the characteristics of individuals who trust environmental information provided by local governments. We find that sex, age, education level, financial robustness, farm size, and the number of distinct land uses are correlated with both innovativeness and connectedness. However, among these characteristics, only education and financial robustness predict trust in environmental information provided by local governments.

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1. Introduction

Water quality in New Zealand is declining precipitously. Indeed, the [Ministry for the Environment \(2013\)](#) reports that 52% of 425 sites monitored around the country are unsafe for swimming, and the Parliamentary Commissioner for the Environment ([PCE, 2013](#)) notes that this trend is increasing.

Declining water quality is associated with land-use change in rural areas, particularly with the rapid expansion of dairy farming ([PCE, 2012, 2013](#)). Despite its small size, New Zealand is now the world's largest dairy exporter and the ninth largest producer of milk, and the country's dairy herd has grown from approximately 3 million to 5 million milking cows over the last 25 years ([Dairy NZ, 2014](#)). Much of the increase in New Zealand's dairy production has been achieved through land-use intensification, i.e. higher volumes of inputs such as fertiliser, water, and energy being used to increase the amount of output per hectare of land. Land-use intensification has contributed to increased concentrations of three diffuse pollu-

tants – pathogens, nutrients, and sediments – diminishing overall water quality.

Declining water quality has sparked widespread public concern, such that New Zealanders consider water quality to be one of the two most important environmental challenges facing the country, the other being water quantity ([Hughes et al., 2013](#)). The topic has become highly visible in the media ([PCE, 2012](#)), is divisive in many parts of the country ([Dominion Post, 2014](#)), and has become arguably the top policy issue on the environmental agenda ([PCE, 2013](#)).

In response to growing concerns about environmental performance, the primary sector (notably, led by the dairy industry) has introduced voluntary measures to improve environmental performance. At the same time, central and regional government have introduced new policies and standards to manage water pollution, including the National Policy Statement on Freshwater Management, which requires regional councils and unitary authorities (hereafter, simply “regional councils”) to set water-quality limits for all major rivers and prescribes the use of a collaborative approach to decision making for water management ([New Zealand Government, 2014](#)). Regional councils thus play important roles not only in developing and enforcing environmental legislation, but

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also in supporting farmers to adopt practices and technologies that enable farmers to meet environmental standards.

Empirically, diffusion of new ideas in New Zealand farming is best facilitated through successful demonstration (Small et al., 2015), and studies in both New Zealand (Morgan et al., 2015) and in other countries (Gladwell, 2002; Rogers, 2003) have found that demonstration is most effective when delivered by credible members of the community who have adopted practices themselves and who have large networks. If regional councils are able to identify such innovative and connected individuals (i.e. “innovators” and “connectors”) to serve as advocates, then they may be able to accelerate uptake of innovation for environmental benefits.

However, rural decision makers in New Zealand have little trust in regional councils as a source of information for environmental performance (Small et al., 2015). As a result, for regional councils to successfully identify potential advocates, they must not only identify the characteristics of innovators and connectors, but also the characteristics of individuals who trust the environmental information that they provide. Inasmuch as a core set of characteristics identifies all three groups, regional councils will be able to target potential champions to implement environmental practices advocated by the council and to spread the knowledge throughout the farming community.

Part 2 of this article describes the institutional framework in which regional councils work in New Zealand and the roles of innovators and connectors in adoption of new practices. Part 3 details the methods used in the analysis of the determinants of innovation, connectedness, and trust in advice on environmental performance. Part 4 presents the main results and Part 5 provides a discussion thereof. Part 6 concludes.

2. Institutional framework

The Local Government Act 2002 sets out the purpose, role, and powers of local government. Under the Act, regional councils are charged with sustainably managing natural resources as well as providing for emergency management and civil defence preparedness, regional transport planning and public transport, and harbour navigation and safety. Responsibility for managing natural resources is further specified in the 1991 Resource Management Act, which specifies that regional councils must prepare regional policy statements and regional plans, both of which set the direction for sustainable management of natural resources. Regional policy statements and regional plans commonly stipulate that regional councils will engage with the public and stakeholders in setting environmental policy; will lead public education and awareness of environmental policy; will provide advice and support for implementing new practices and technologies; and will undertake environmental research and monitoring.

New Zealand farmers are more likely to implement new practices and technologies if they have first seen them successfully demonstrated (e.g. Brown et al., 2013; Small et al., 2015). Previous studies have shown that credibility is especially important to farmers (e.g. Kromm and White, 1991; Wright and Shindler, 2001; Rosenberg and Margerum, 2008), where credibility is a function of both trustworthiness and expertise (Andreoli and Worchel, 1978).

While regional councils undoubtedly hold important expertise about practices and technologies for better environmental outcomes, rural decision makers in New Zealand give little credence to the veracity of advice on environmental performance provided by regional councils. Indeed, in a survey of trust in sources of environmental information, regional councils ranked 16th of 17, ahead of television but well behind the Internet (Small et al., 2015). This finding contrasts that of Baird et al. (2016), who find that regional

advisors are the most trusted and influential source of advice in Alberta.

Blind (2006) notes that public trust in government and political institutions has been decreasing in all advanced industrialised democracies since the mid-1960s. Moreover, some farmers are simply “difficult-to-reach” as they choose to trust other sources of information over resource-management experts such as regional councils (Kromm and White, 1991; Morrison et al., 2015). Such farmers look increasingly to other members of the farming community for credible information about environmental performance (Carr and Tait, 1990). Thus, for regional councils to facilitate the spread of new farming practices and technologies for better environmental outcomes, they must identify members of the farming community with whom to collaborate.

Rogers (2003) outlines a typology of innovation based on the timing at which individuals adopt a given practice or technology relative to others in the social system of interest. “Early adopters” (who comprise a minority of farmers in Rogers’ framework) play a critical role in spreading ideas from a tiny number of first adopters to the broader community. Rogers (2003) notes that this group may be targeted to speed the diffusion process. Similarly, connectors (Gladwell, 2002) are defined as individuals with large personal networks. As such, connectors are critical to the diffusion of an innovation or set of innovations as they can connect large numbers of people with new ideas, even if they are not among the first to adopt them.

3. Methods

3.1. The New Zealand Survey of Rural Decision Makers

The empirical analysis is based on the Survey of Rural Decision Makers (Brown, 2013; Brown, 2015), a large, nationally representative survey of land owners and rural stakeholders. The survey was conducted online between March and July 2013.

The survey gathered up to 192 data points on each respondent, including detailed data on innovation, networks, trust, demographics, land characteristics and management, and financial performance (Brown, 2013). Detailed information about the survey design, questions, and summary statistics may be accessed on the Landcare Research website.¹

The sample was drawn from theASUREQuality AgriBase database. Developed in 1993 to track foot and mouth disease, AgriBase records detailed information on privately held rural land across New Zealand (ASUREQuality, 2015). The database included 7448 potential respondents with email contacts. However, inclusion in AgriBase is voluntary and entries are updated irregularly. As such, the median email address was entered into the database seven years before the survey and some of the individuals contacted for the survey had left farming, making the true response rate difficult to ascertain. A total of 1564 responses were collected, yielding a response rate of at least 21%.² Participation was incentivised via a donation made to a charity of the respondents’ choice, and an invitation to view summary results online after the survey had closed. The survey took 16 min to complete, on average.

Summary statistics for the variables of interest are shown in Table 1. To measure innovativeness, we develop an index variable with three components – risk tolerance, openness to experi-

¹ <http://www.landcareresearch.co.nz/science/portfolios/enhancing-policy-effectiveness/srdm>

² We are not able to track bounced or emails that were otherwise unopened, hence the size of the potential sample is difficult to determine. Regardless, 21% falls in the high end of the expected range of response rates of 10–25% for modern online surveys reported by Sauermann and Roach (2013).

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